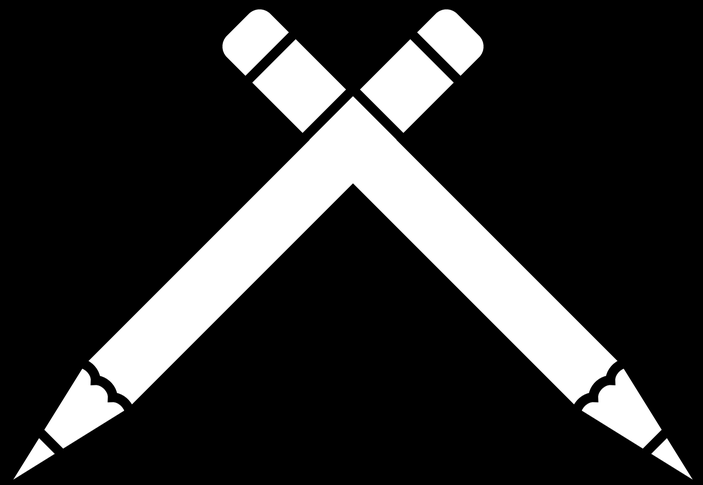
CS50's Curriculum

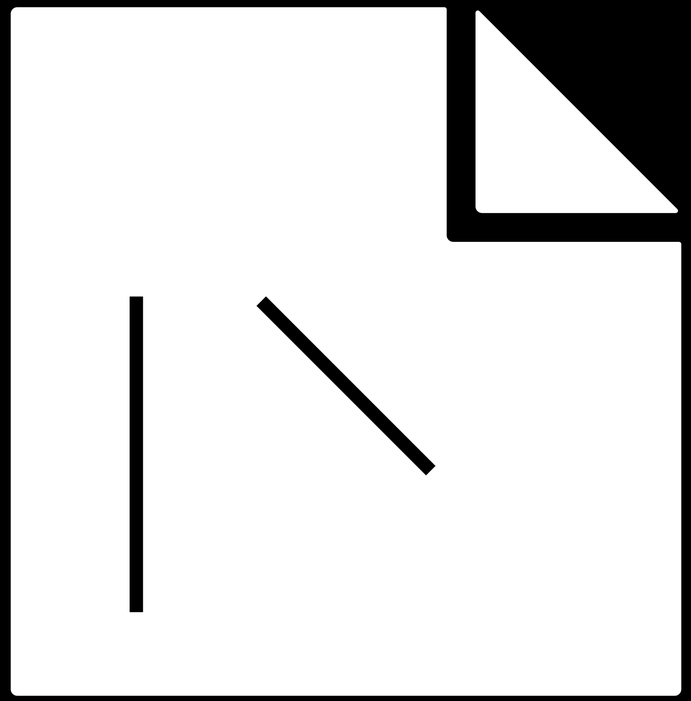
Carter Zenke



Name

From where you've traveled

Favorite memory in CS50



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Accessibility

Community

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CS50 Handbook

David J. Malan
malan@harvard.edu

Welcome to the CS50 Handbook!

Teaching CS50? Welcome to the team! Use the sidebar on the left to access resources for your course.

CS50 AP 2023–2024 - CS50 H

cs50.tf/ap/2024/

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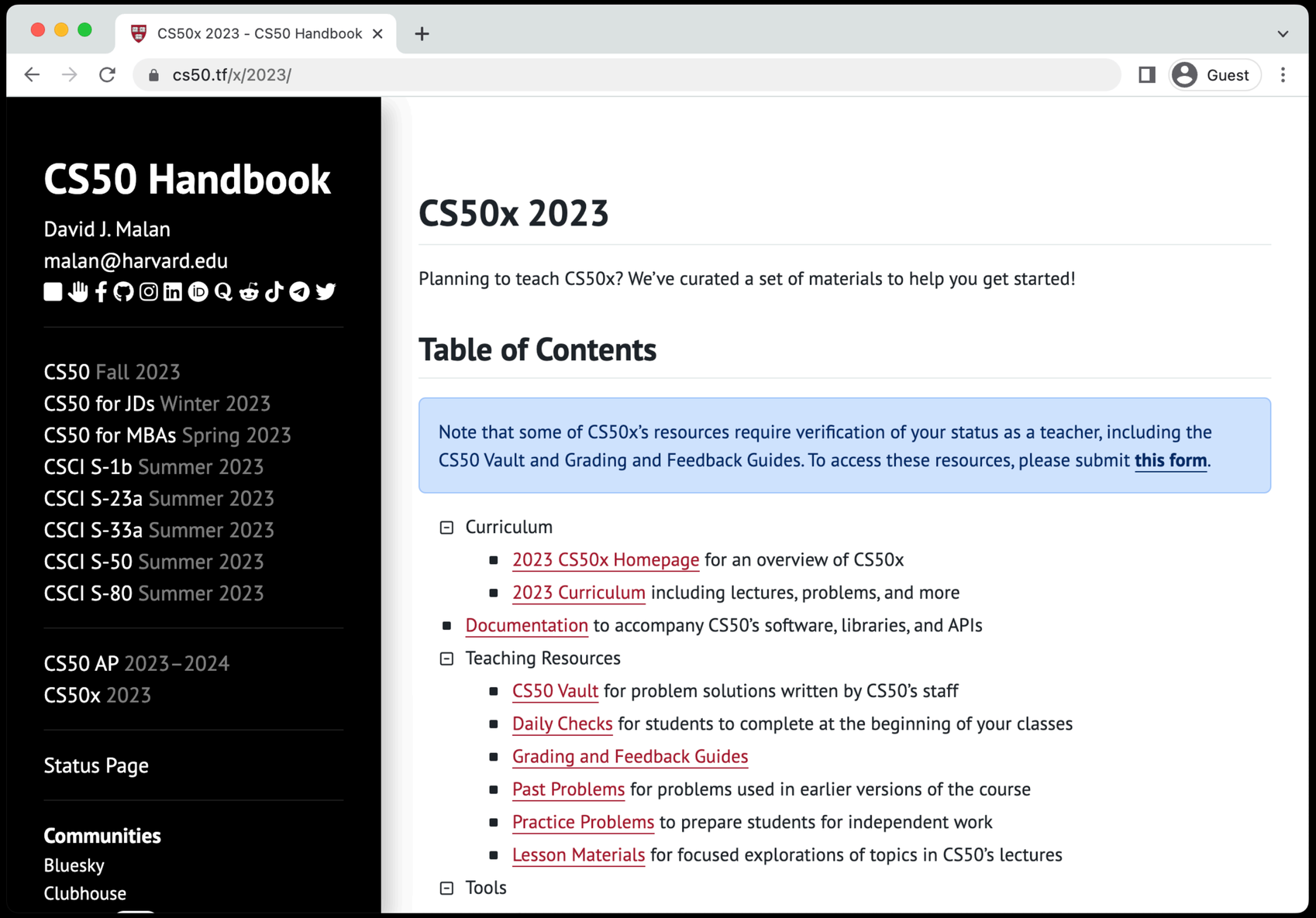
CS50 AP 2023–2024

Planning to teach CS50 AP? We've curated a set of materials to help you get started!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Lesson Materials for focused explorations of topics in CS50's lectures
Tools

Build your Curriculum

CS50 AP 2023–2024

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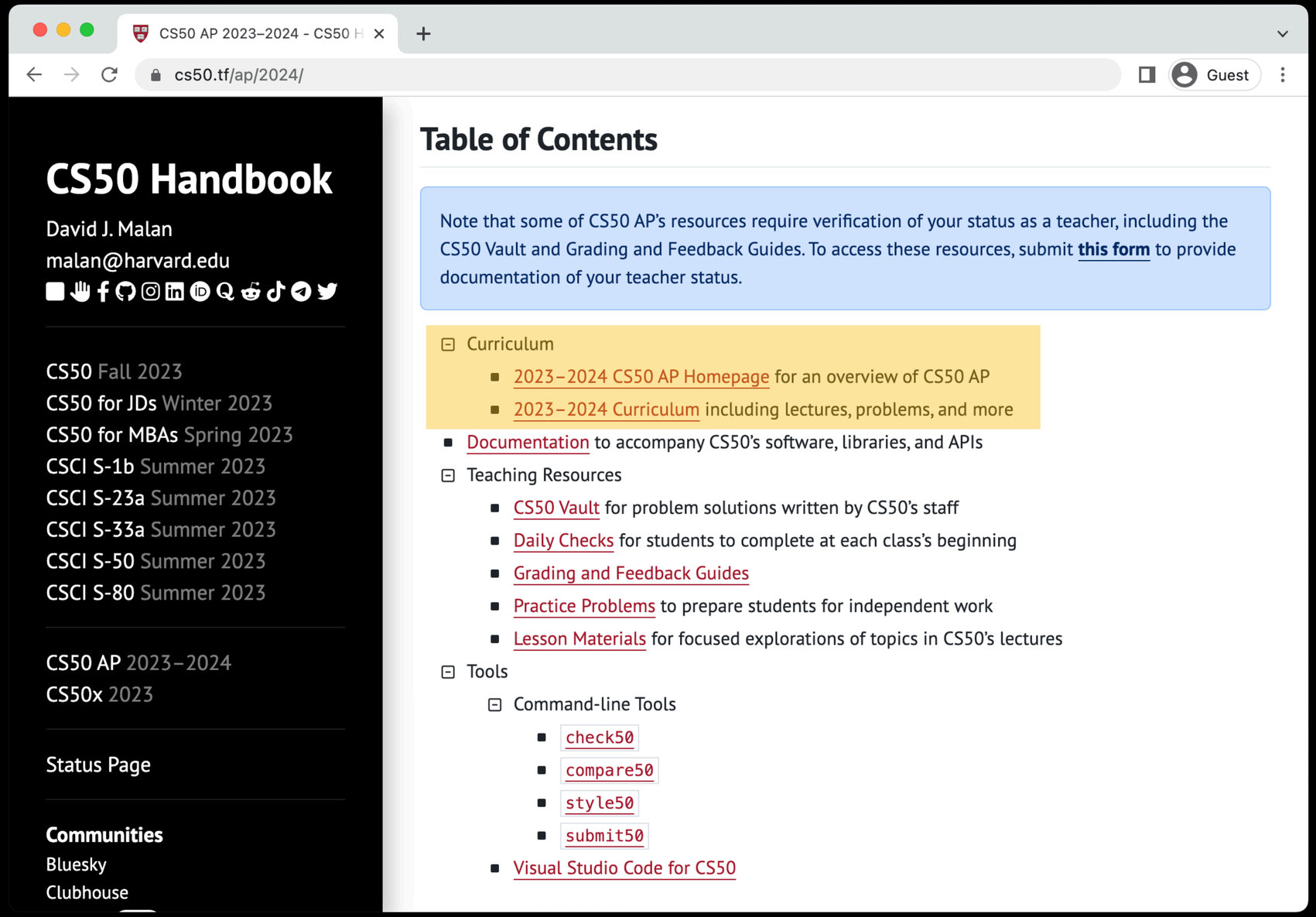
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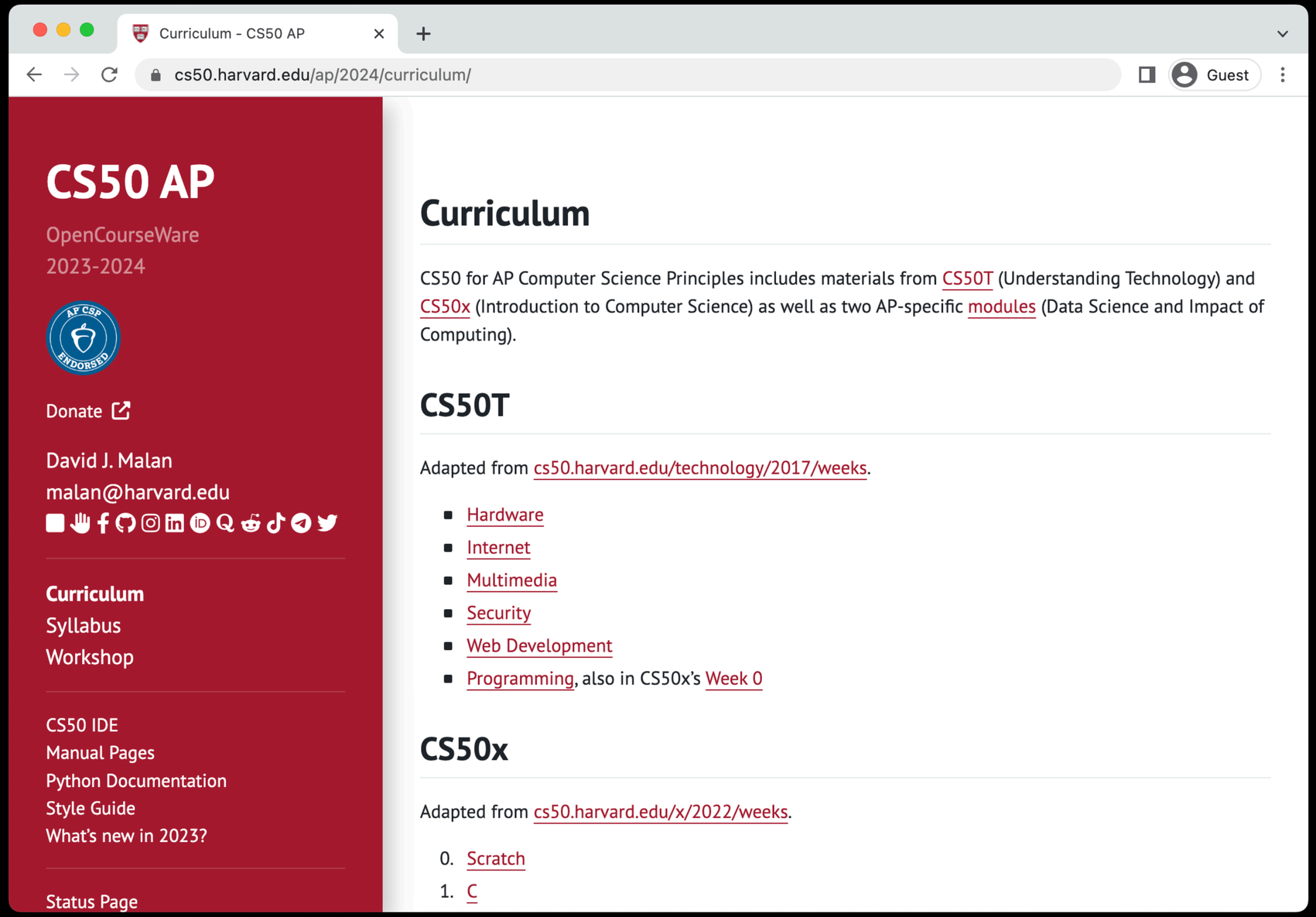
Curriculum - CS50 AP
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CS50 for AP Computer Science Principles includes materials from CS50T (Understanding Technology) and CS50x (Introduction to Computer Science) as well as two AP-specific modules (Data Science and Impact of Computing).
CS50T
Adapted from cs50.harvard.edu/technology/2017/weeks.
Hardware
Internet
Multimedia
Security
Web Development
Programming, also in CS50x's Week 0
CS50x
Adapted from cs50.harvard.edu/x/2022/weeks.
0. Scratch
1. C

Scratch

C

Arrays

Algorithms

Memory

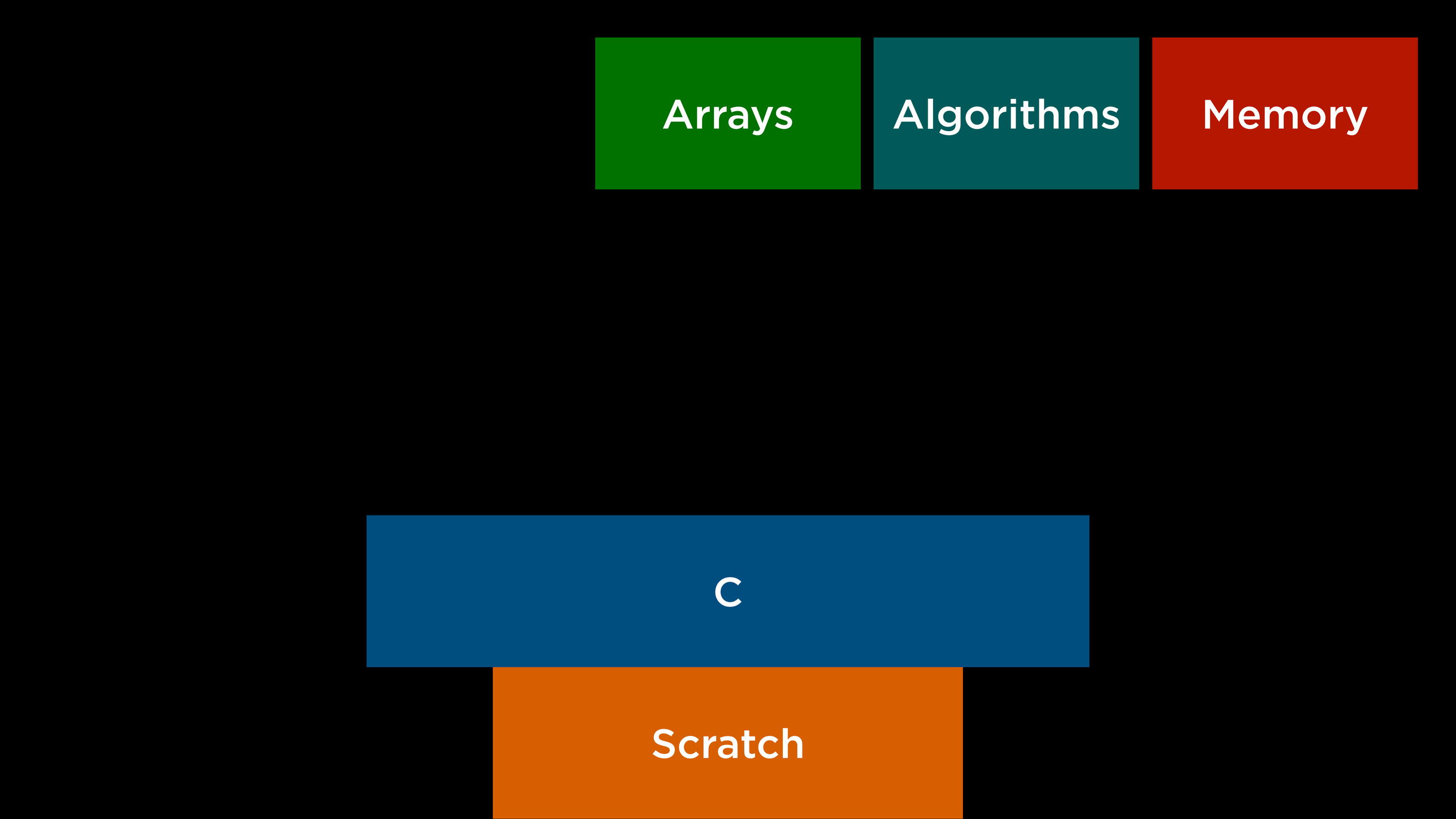
C

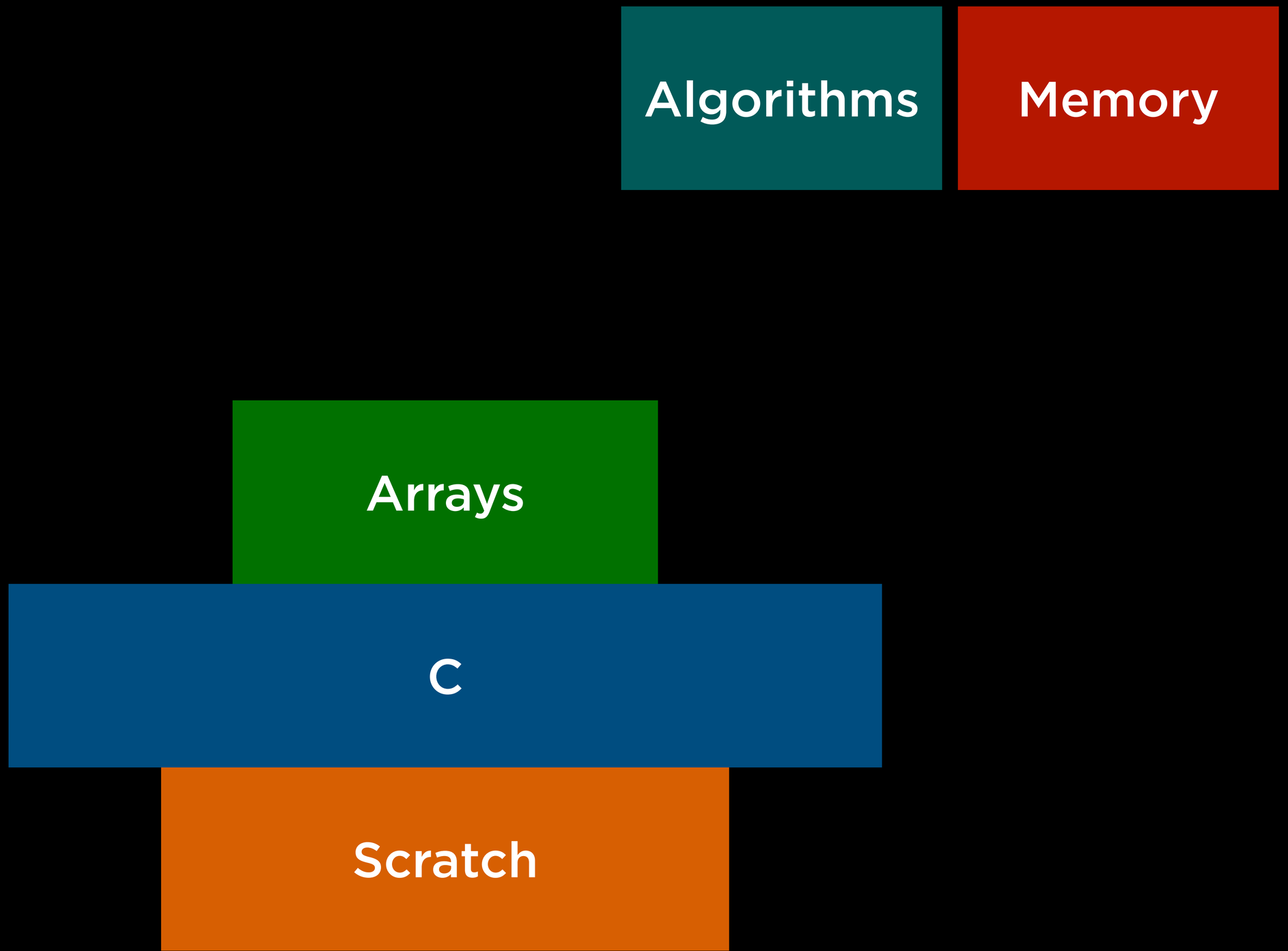
Arrays

Algorithms

Memory

Scratch


Arrays
Algorithms
Memory
C
Scratch


Algorithms
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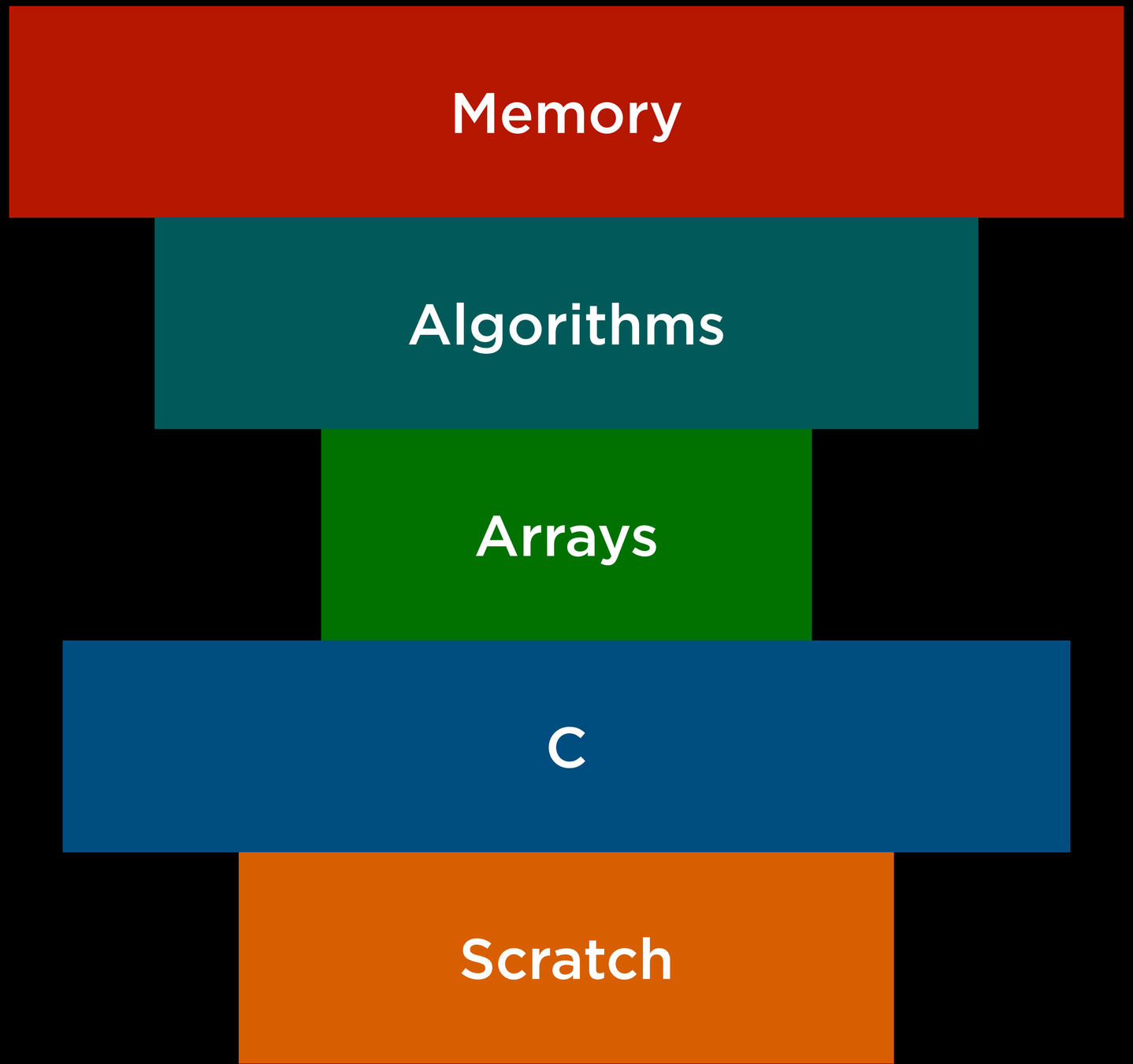
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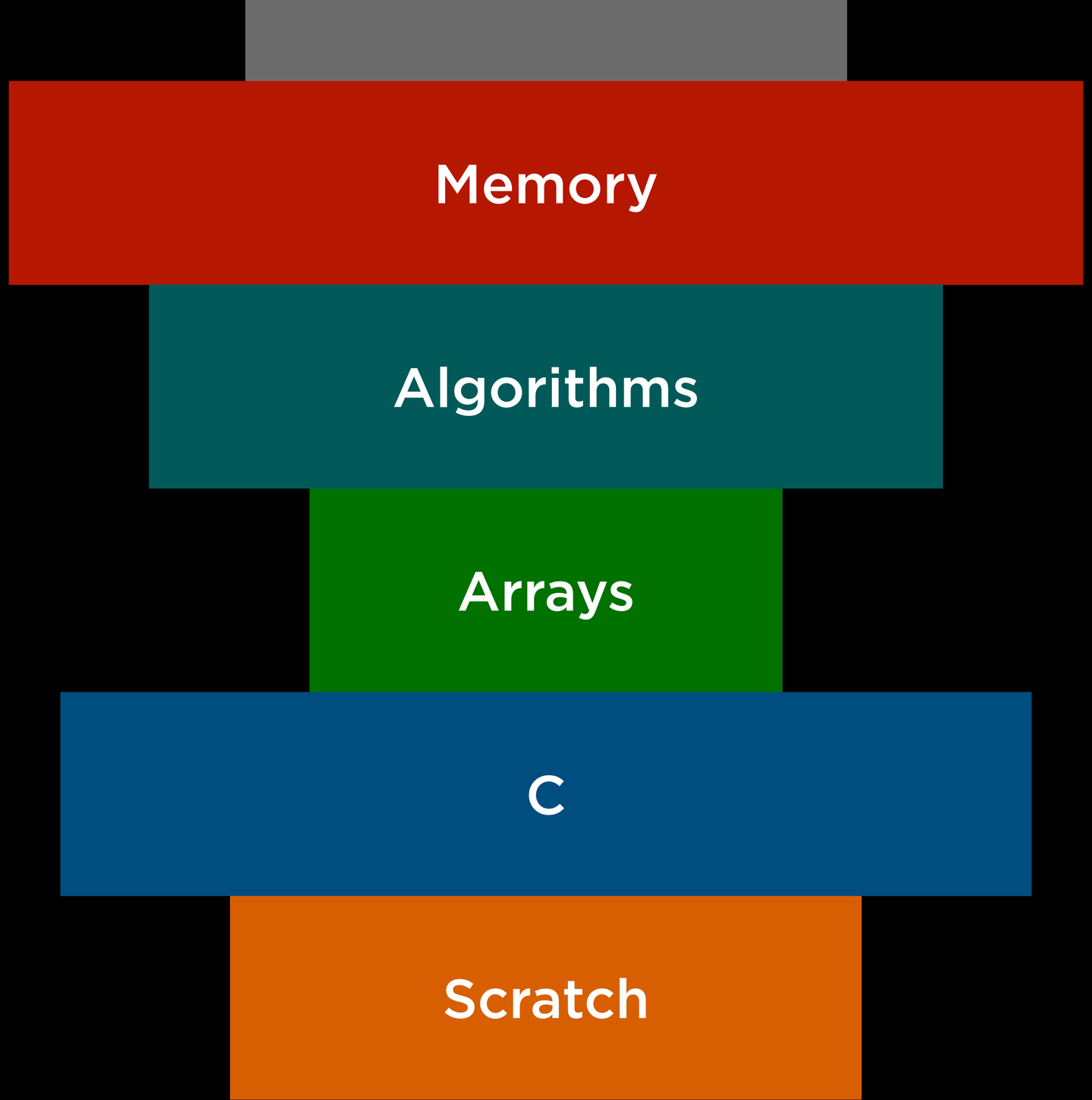
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Adopt or Adapt

Lectures

Sections

Shorts

Week 0 Scratch - CS50 AP

cs50.harvard.edu/ap/2024/curriculum/x/weeks/0/

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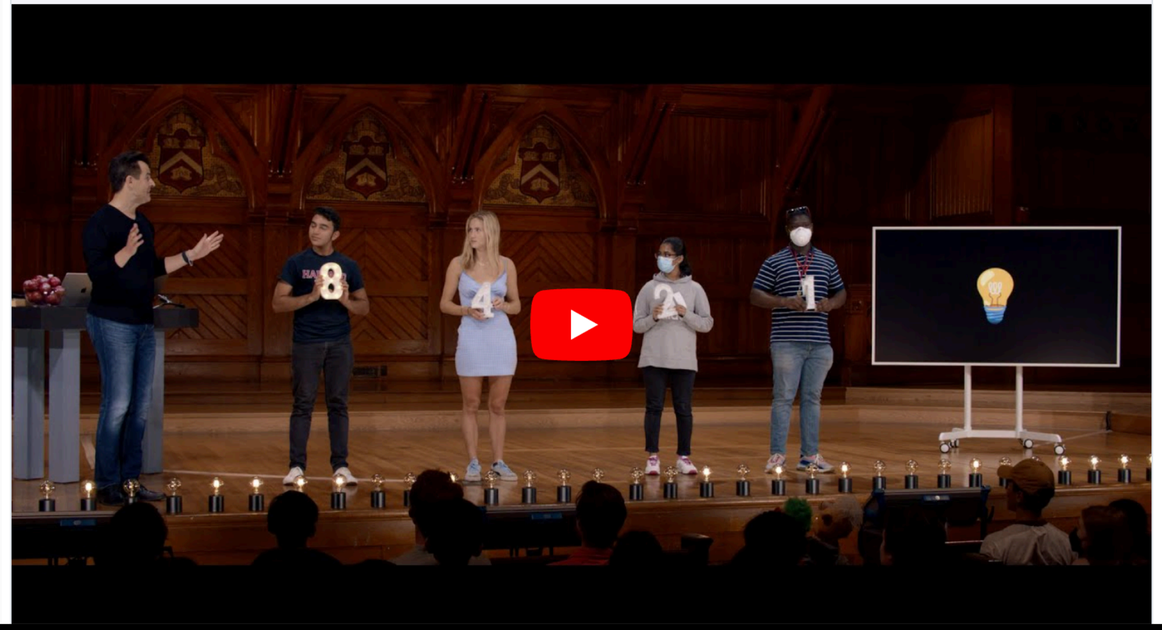
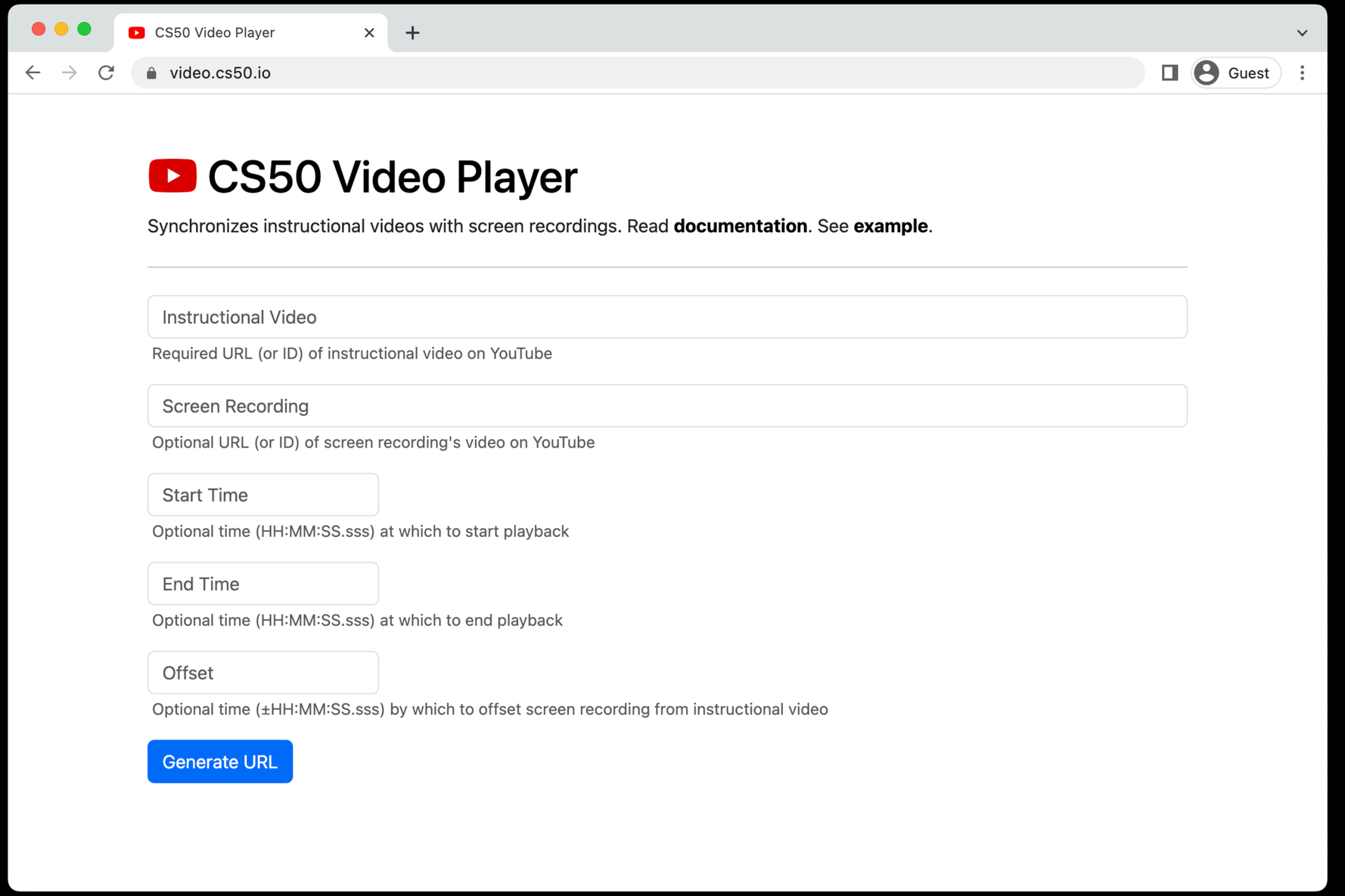
Week 0 Scratch

Computer Science. Computational Thinking. Problem Solving: Inputs, Outputs. Representation: Unary, Binary, Decimal, ASCII, Unicode, RGB. Abstraction. Algorithms. Running Times. Pseudocode. Scratch: Functions, Arguments, Return Values; Variables; Boolean Expressions, Conditionals; Loops; Events; Threads.

CS50 Screen




CS50 Video Player
video.cs50.io
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CS50 Video Player
Synchronizes instructional videos with screen recordings. Read documentation. See example.
Instructional Video
Required URL (or ID) of instructional video on YouTube
Screen Recording
Optional URL (or ID) of screen recording's video on YouTube
Start Time
Optional time (HH:MM:SS.sss) at which to start playback
End Time
Optional time (HH:MM:SS.sss) at which to end playback
Offset
Optional time (±HH:MM:SS.sss) by which to offset screen recording from instructional video
Generate URL

Functions - CS50 AP

cs50.harvard.edu/ap/2024/curriculum/x/shorts/functions/

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- Subtitles
- Transcript

Week 9 Flask - CS50 AP

cs50.harvard.edu/ap/2024/curriculum/x/sections/9/

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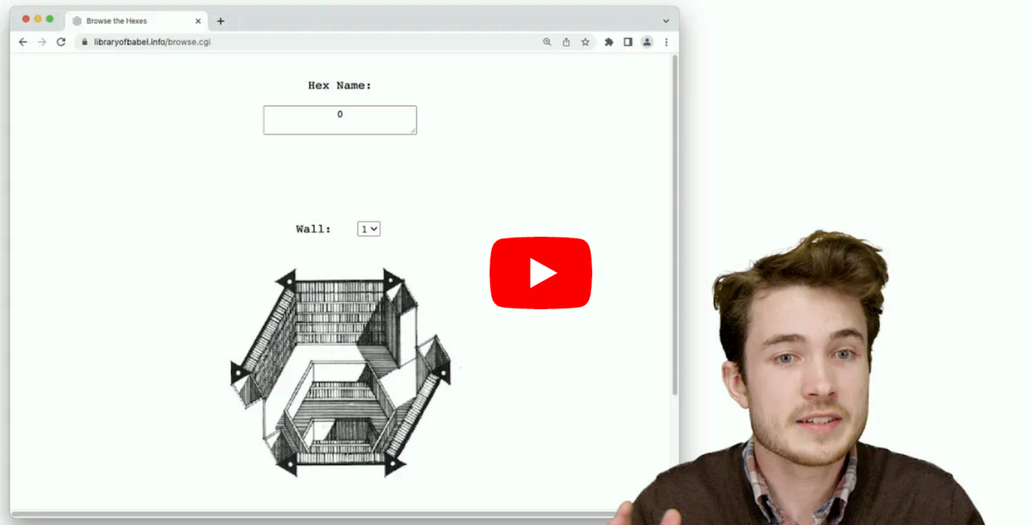


- Audio
- Slides

Problem Sets

Those More Comfortable

Those Somewhere in Between

Those Less Comfortable

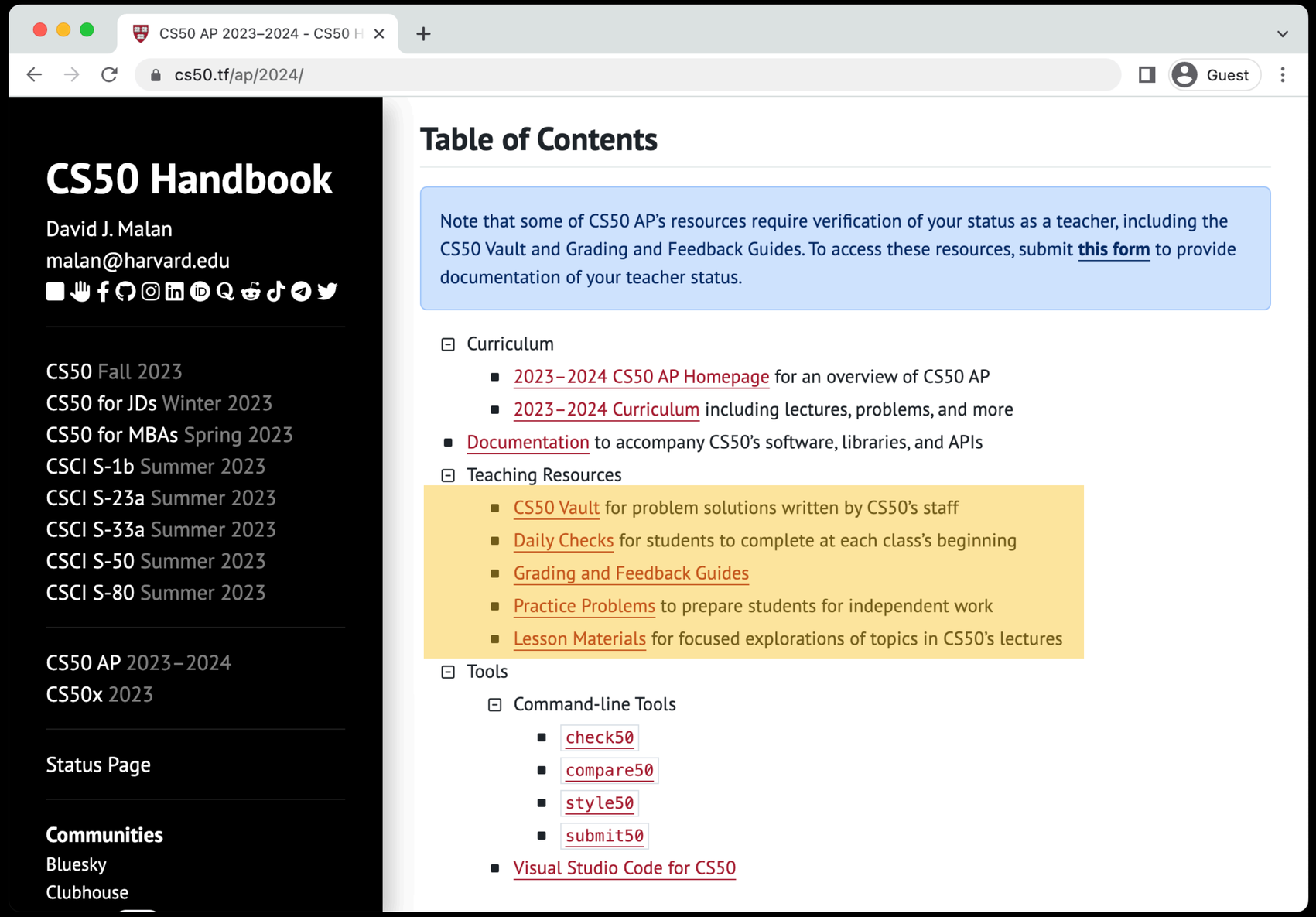
Those More Comfortable

Those Somewhere in Between

Those Less Comfortable

Those Least Comfortable

Teaching Resources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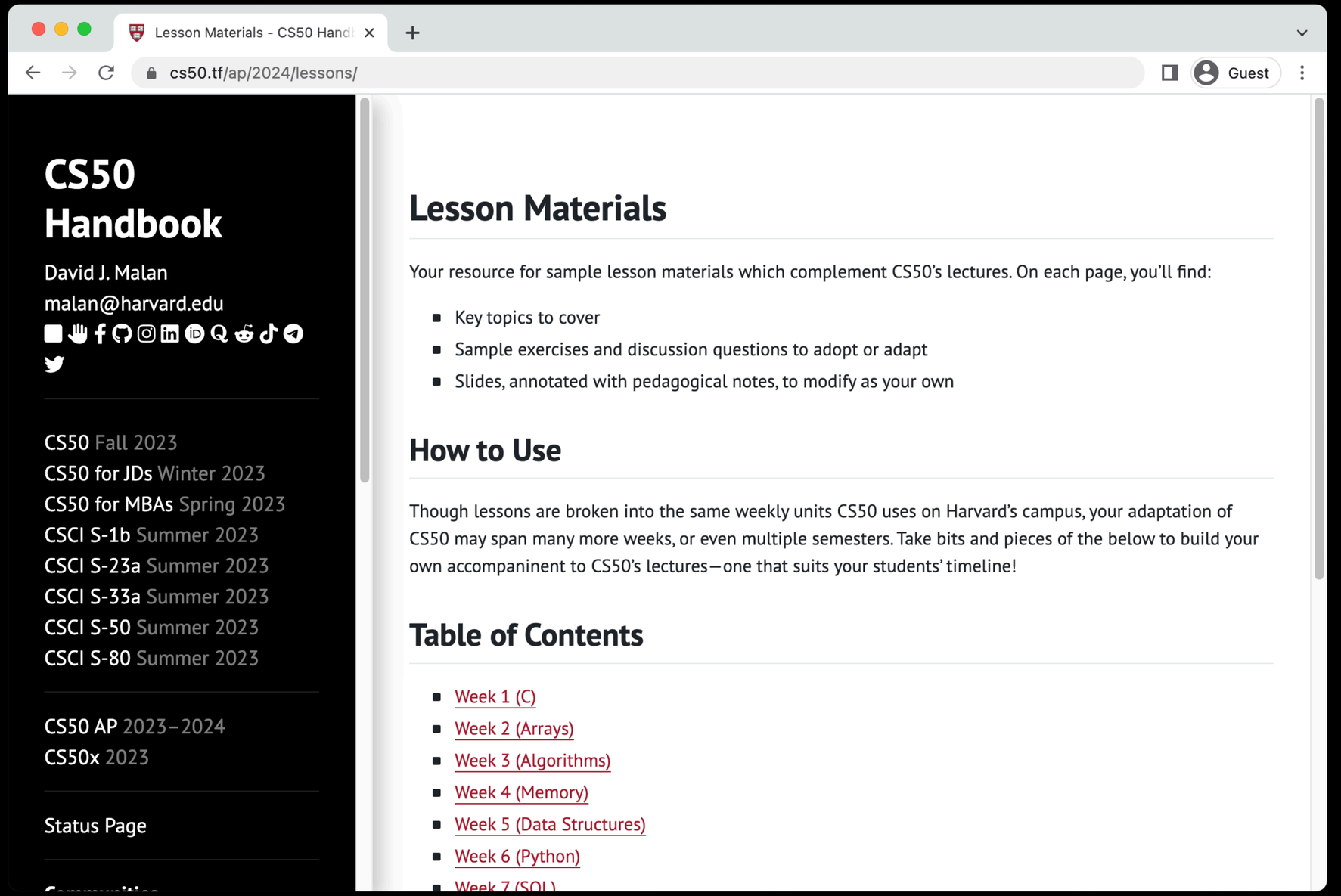
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Lesson Materials
Your resource for sample lesson materials which complement CS50's lectures. On each page, you'll find:
Key topics to cover
Sample exercises and discussion questions to adopt or adapt
Slides, annotated with pedagogical notes, to modify as your own
How to Use
Though lessons are broken into the same weekly units CS50 uses on Harvard's campus, your adaptation of CS50 may span many more weeks, or even multiple semesters. Take bits and pieces of the below to build your own accompaninent to CS50's lectures—one that suits your students' timeline!
Table of Contents
Week 1 (C)
Week 2 (Arrays)
Week 3 (Algorithms)
Week 4 (Memory)
Week 5 (Data Structures)
Week 6 (Python)

CS50 Week 1 — Sample Annota

docs.google.com/presentation/d/16jrorddtwlK4E7sHjxWWD_J7InB_9theBwdMChQtodk/edit#slide=id.g1307066d780_0_4

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CS50 Week 1 — Sample Annotated Slides

Saved to Drive

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Slideshow

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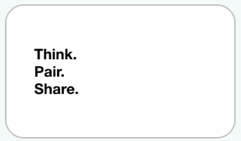

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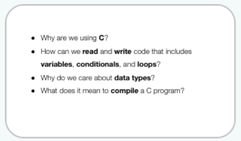

5

Sample Slides for Week 1 (C)

Welcome!

Here you'll find sample slides to adopt or adapt when teaching Week 1, on topics such as C, variables, conditionals, loops, and types.

Some slides contain speaker notes to illustrate why the sample slides take a certain approach to illustrating a concept or leading an exercise. You're welcome to modify these slides as you see fit, though do try to keep some of the same elements of active learning that have been included in these samples.

CS50 Week 1 — Sample Annota

docs.google.com/presentation/d/16jrorddtwlK4E7sHjxWWD_J7InB_9theBwdMChQtodk/edit#slide=id.g10ffb891ccb_0_113

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CS50 Week 1 — Sample Annotated Slides

File Edit View Help

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Share.

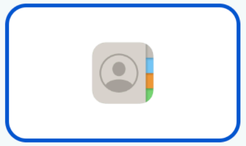
4

- Why are we using **C**?
- How can we **read** and **write** code that includes **variables**, **conditionals**, and **loops**?
- Why do we care about **data types**?
- What does it mean to **compile** a C program?

5

Part 1 Variables and Types
Input and Printing

6



7

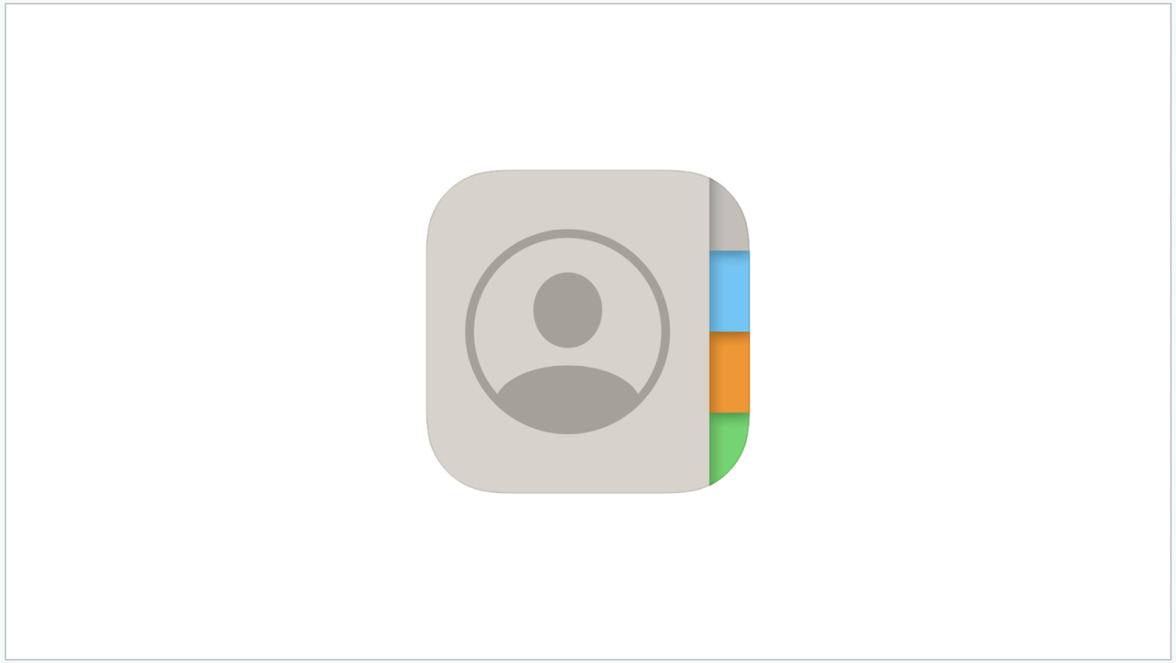
Variables

```
calls
  4
```

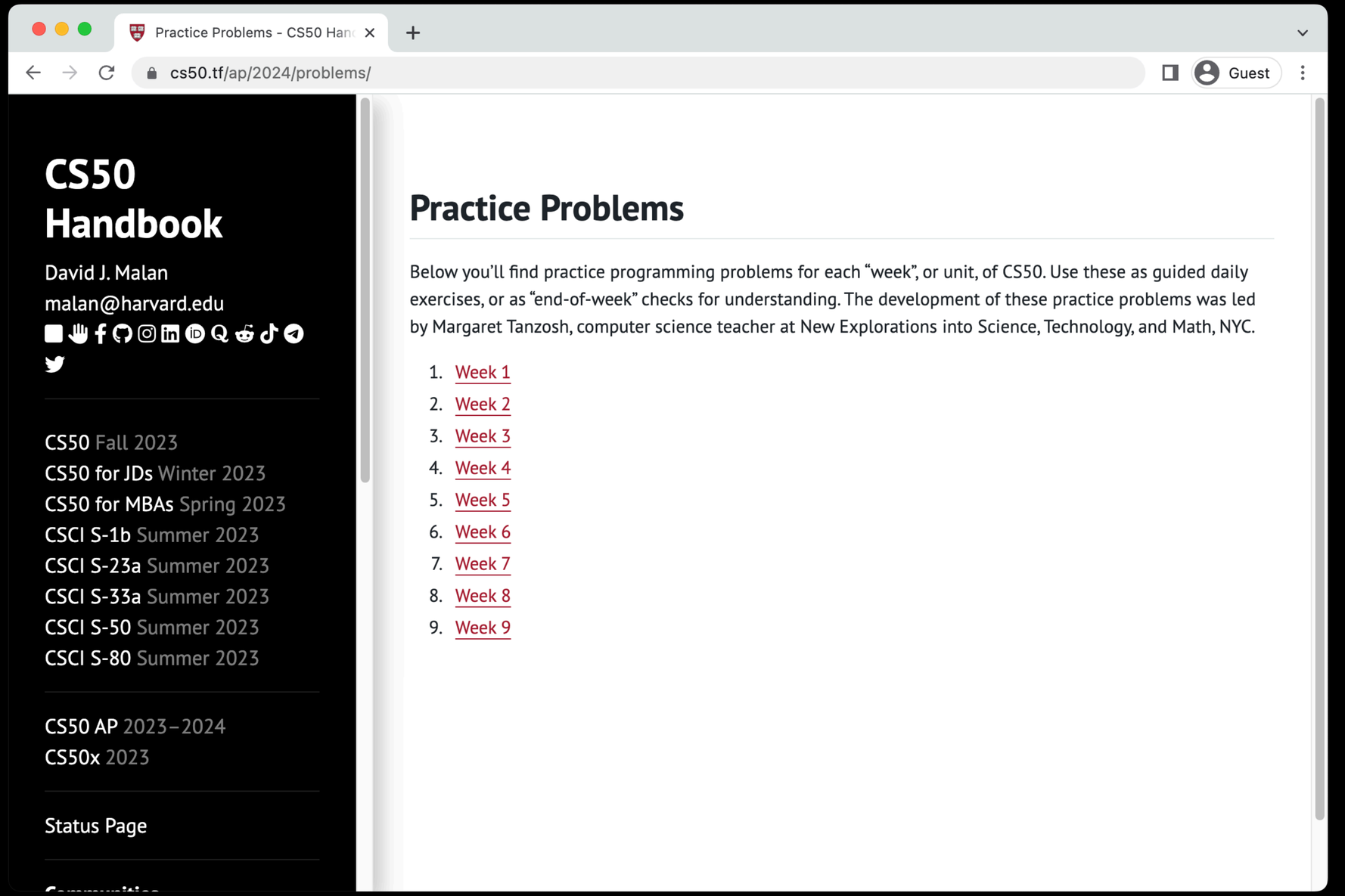
8

Variables

```
int calls = 4;      calls
```



Introducing "callbacks" to lecture in section can help students remember information from the lecture and use it in a new context, the present section. Here we introduce an example of a contacts application, calling back to the lecture's phonebook example.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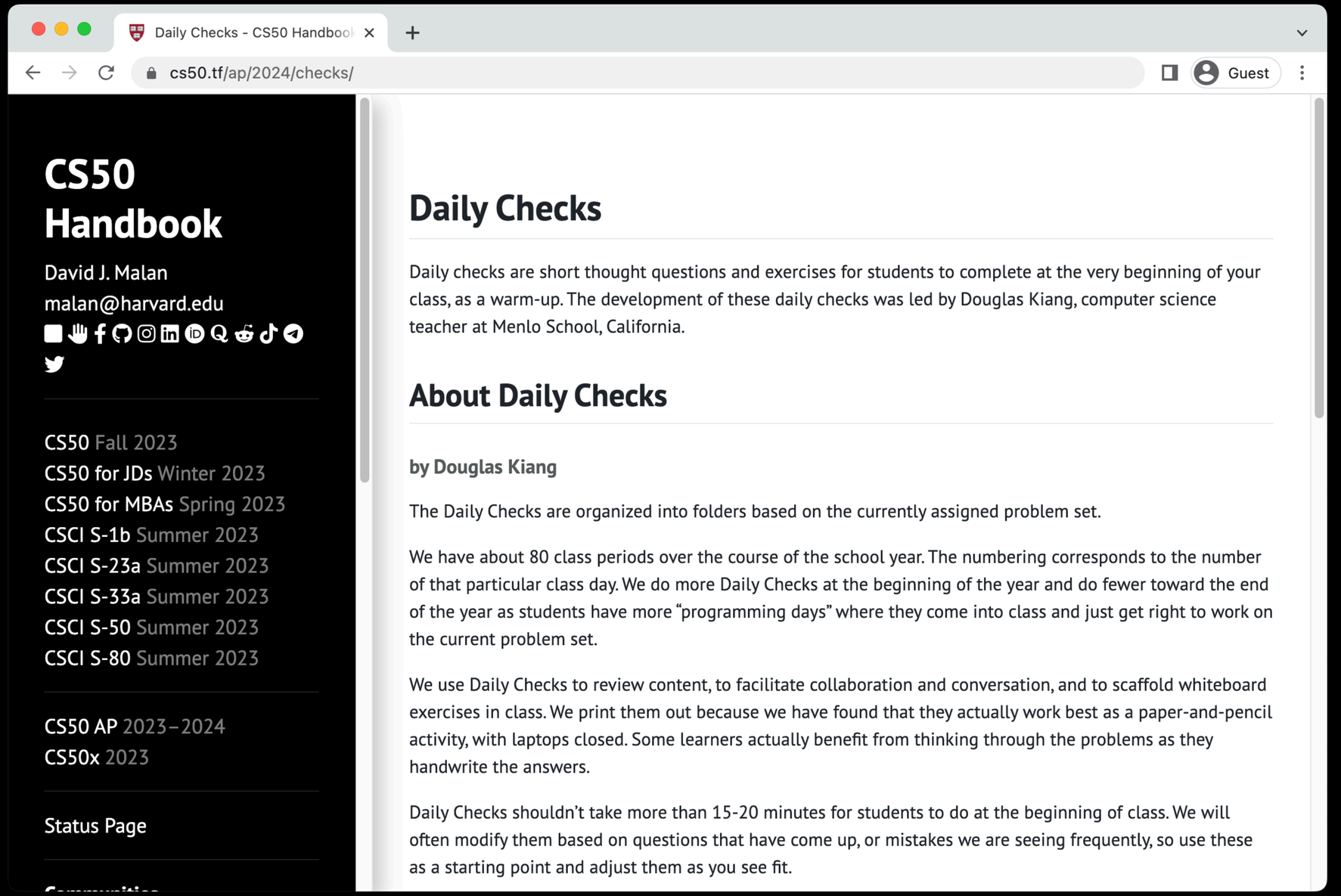
Practice Problems
Below you'll find practice programming problems for each "week", or unit, of CS50. Use these as guided daily exercises, or as "end-of-week" checks for understanding. The development of these practice problems was led by Margaret Tanzosh, computer science teacher at New Explorations into Science, Technology, and Math, NYC.
1. Week 1
2. Week 2
3. Week 3
4. Week 4
5. Week 5
6. Week 6
7. Week 7
8. Week 8
9. Week 9


Daily Checks - CS50 Handbook
cs50.tf/ap/2024/checks/
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Daily Checks
Daily checks are short thought questions and exercises for students to complete at the very beginning of your class, as a warm-up. The development of these daily checks was led by Douglas Kiang, computer science teacher at Menlo School, California.
About Daily Checks
by Douglas Kiang
The Daily Checks are organized into folders based on the currently assigned problem set.
We have about 80 class periods over the course of the school year. The numbering corresponds to the number of that particular class day. We do more Daily Checks at the beginning of the year and do fewer toward the end of the year as students have more “programming days” where they come into class and just get right to work on the current problem set.
We use Daily Checks to review content, to facilitate collaboration and conversation, and to scaffold whiteboard exercises in class. We print them out because we have found that they actually work best as a paper-and-pencil activity, with laptops closed. Some learners actually benefit from thinking through the problems as they handwrite the answers.
Daily Checks shouldn’t take more than 15-20 minutes for students to do at the beginning of class. We will often modify them based on questions that have come up, or mistakes we are seeing frequently, so use these as a starting point and adjust them as you see fit.

Software Tools

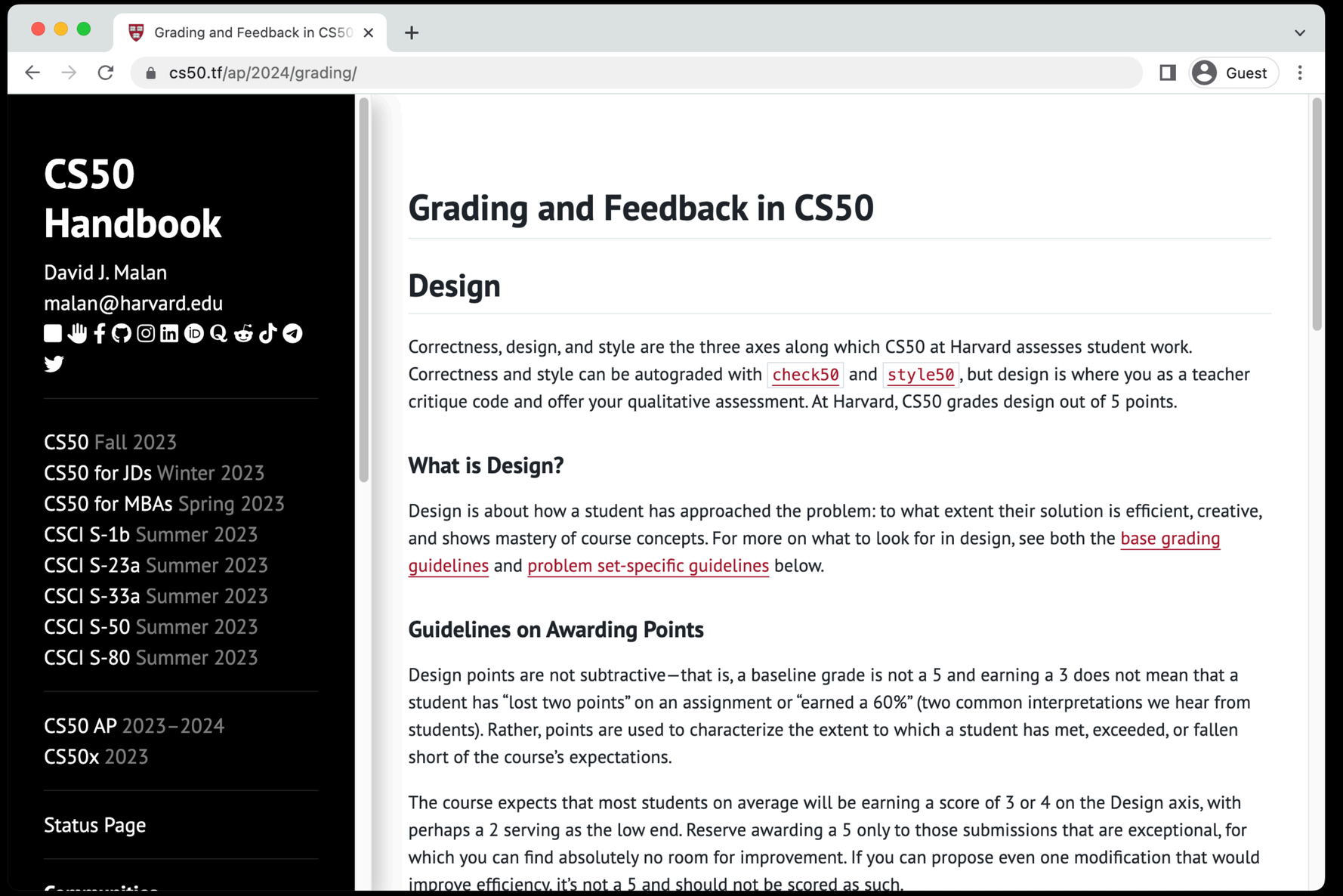
check50

submit50

submit.cs50.io

…

Feedback


Grading and Feedback in CS50
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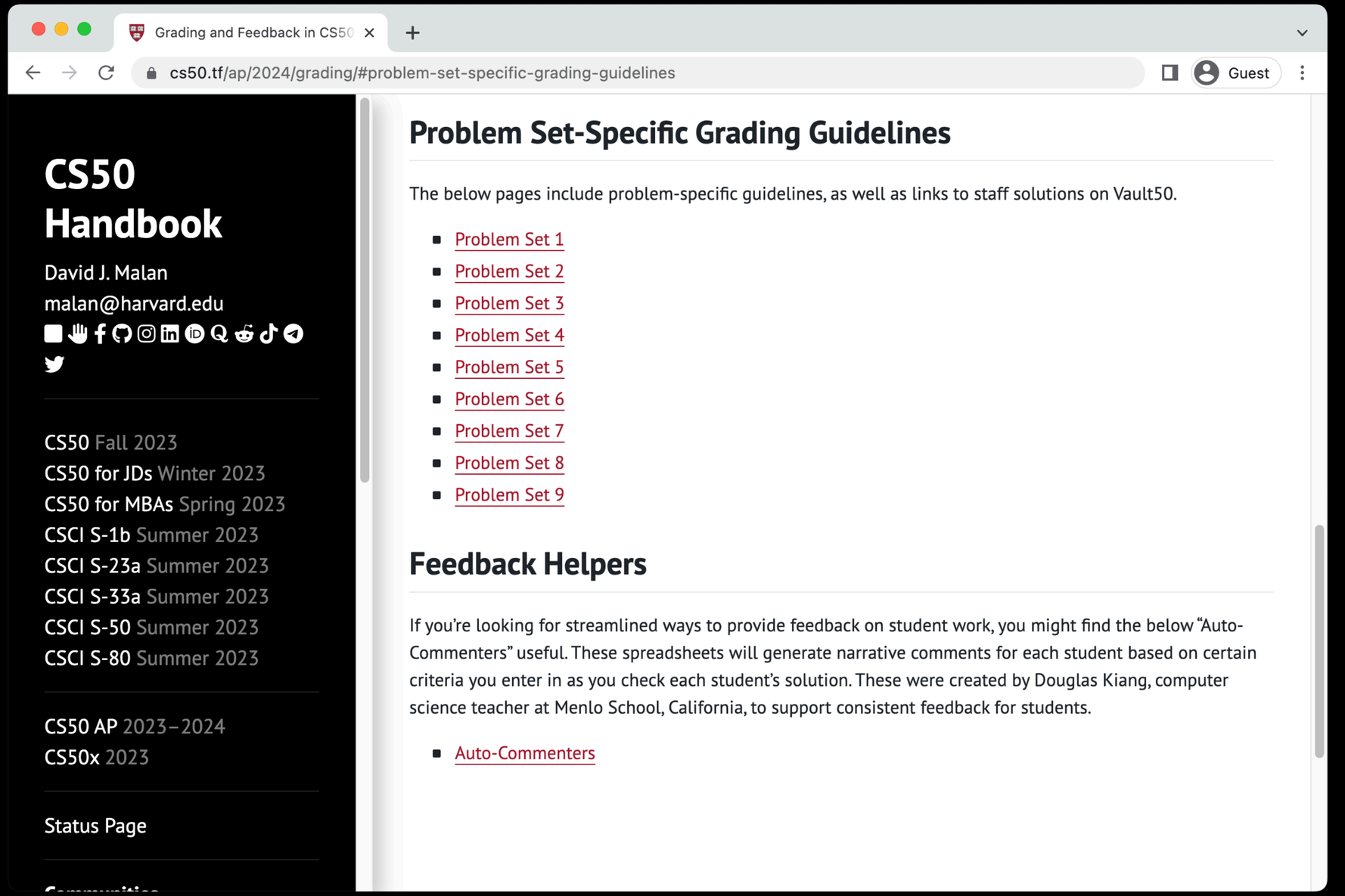
Grading and Feedback in CS50
Design
Correctness, design, and style are the three axes along which CS50 at Harvard assesses student work. Correctness and style can be autograded with check50 and style50, but design is where you as a teacher critique code and offer your qualitative assessment. At Harvard, CS50 grades design out of 5 points.
What is Design?
Design is about how a student has approached the problem: to what extent their solution is efficient, creative, and shows mastery of course concepts. For more on what to look for in design, see both the base grading guidelines and problem set-specific guidelines below.
Guidelines on Awarding Points
Design points are not subtractive—that is, a baseline grade is not a 5 and earning a 3 does not mean that a student has "lost two points" on an assignment or "earned a 60%" (two common interpretations we hear from students). Rather, points are used to characterize the extent to which a student has met, exceeded, or fallen short of the course's expectations.
The course expects that most students on average will be earning a score of 3 or 4 on the Design axis, with perhaps a 2 serving as the low end. Reserve awarding a 5 only to those submissions that are exceptional, for which you can find absolutely no room for improvement. If you can propose even one modification that would improve efficiency, it's not a 5 and should not be scored as such.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cs50.tf/ap/2024/grading/#problem-set-specific-grading-guidelines
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Problem Set-Specific Grading Guidelines
The below pages include problem-specific guidelines, as well as links to staff solutions on Vault50.
Problem Set 1
Problem Set 2
Problem Set 3
Problem Set 4
Problem Set 5
Problem Set 6
Problem Set 7
Problem Set 8
Problem Set 9
Feedback Helpers
If you're looking for streamlined ways to provide feedback on student work, you might find the below "Auto-Commenters" useful. These spreadsheets will generate narrative comments for each student based on certain criteria you enter in as you check each student's solution. These were created by Douglas Kiang, computer science teacher at Menlo School, California, to support consistent feedback for students.
Auto-Commenters

Additional Courses

CS50: Computer Science Cour

edx.org/cs50

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CS50 Courses New

CS50's Introduction to Computer Science

Harvard University

Course

CS50's Introduction to Programming with Python

Harvard University

Course

CS50's Web Programming with Python and JavaScript

Harvard University

Course

CS50's Computer Science for Business Professionals

CS50's Computer Science for Lawyers

CS50's Introduction to Artificial Intelligence with Python

CS50's Introduction to Cybersecurity ✨

CS50's Introduction to Databases with SQL ✨

CS50's Introduction to Game Development

CS50's Introduction to Programming with Python

CS50's Introduction to Programming with Scratch

CS50's Mobile App Development with React Native

CS50's Understanding Technology

CS50's Web Programming with Python and JavaScript


I took CS50
CS50 proud

What questions do you have?

CS50's Curriculum

Carter Zenke